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Before The
Federal Communications Commission
Washington, D.C. 20554

NOV 18 1987

Federal Communications Commission
Office of the Secretary

In the Matter of)

Advanced Television Systems)
And Their Impact on the)
Existing Television Broadcast)
Service)

MM Docket No. 87-268

Review of Technical and)
Operational Requirements:)
Part 73-E, Television Broadcast)
Stations)

Reevaluation of the UHF)
Television Channel and Distance)
Separations of Part 73 of the)
Commission's Rules)

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Comments of National Public Radio

National Public Radio (NPR) offers the following comments on the Notice of Inquiry (NOI) in the above-captioned docket. NPR requests that the Commission take into account the needs and interests of advanced audio technology in its consideration of spectrum issues in this docket.

NPR is a nonprofit membership organization which provides programming and interconnection services to more than 345 full-service public radio stations and represents them in developing and maintaining viable and diverse radio service for the American public.

NPR believes that the Commission should carefully examine the spectrum allocation issues raised by the NOI. The Commission's

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decisions on the future allocation and utilization of spectrum will necessarily have an impact on audio technology.

Developments in audio technology that would significantly increase the quality of the broadcast technology and audio sound also have important spectrum requirements which must be considered in this comprehensive review of spectrum usage.

NPR appreciates this opportunity to discuss the potential of advanced audio technology with the Commission.

I. Advanced Audio Technology Has Important Spectrum Requirements

New audio technologies are in various stages of planning and development. Many of these new technologies will almost certainly require bandwidths wider than those presently allocated to FM broadcasters. In this docket, the Commission should act to encourage further development of advanced audio technology by assuring availability of spectrum.

Radio is an important force for educating, entertaining, and informing the American public. Radio today offers a variety of programs which enlighten, inspire, inform, relax and amuse. Public radio in particular has a significant record of accomplishment in encouraging and enriching the human mind and spirit across the country.

Radio competes for the attention of audiences with numerous other forms of communication, including television, cable, stereo, compact disc players, and video cassette recorders. Radio must remain versatile and feature high quality sound in order to maintain its audience. Just as more advanced visual

technologies, such as high definition television, may improve television picture and sound, improved sound technology and equipment are being examined with a view toward enhancing audio programming. Most of the audio technology advances are based on digital encoding techniques.

A. Digital Audio Technology

In radio and television studios across the country, broadcasters are replacing analog audio processing equipment with digital audio processing equipment. Soon most audio processing will take place digitally because digital processing allows storage and retrieval of audio information without degradation. However, since digital signal processing is currently limited to broadcast production, broadcasters cannot transmit digital signals and take full advantage of digital technology.

Digital audio broadcasts have been demonstrated experimentally by transmitting a digitally coded sound at the radio station and decoding the signal at its destination, the listener's home. Instead of the broadcast station modulating its frequency by a signal which attempts to imitate the actual sonic waveform (or "analog"), with digital broadcasting the station would modulate this carrier with a high density datastream--a series of "on or off pulses" at a high rate of speed--creating a "digitized" representation of the original sound wave.

The advantage of a digital audio broadcast lies in the fact that most noise or interference is ignored by the digital receiver, which recreates clean audio identical to the original sound, as long as the datastream is fed uninterrupted to the

receiver. The sound is essentially impervious to any degradation while it is in digital form and can be transmitted over a wide range of reception conditions.

B. The WGBH Experience

The Commission has granted an experimental permit to WGBH-FM, a public radio station in Boston and NPR member, to use a UHF television channel for testing digital audio broadcasts. WGBH-FM delivered its FM-radio programming to its jointly licensed public television station, WGBX/Channel 44, using a Sony PCM-F1 digital audio processor which converts analog audio signals to digital audio and then represents the datastream in conventional video format. Listeners receive the video signal on a video cassette recorder (VCR) connected to a PCM (pulse code modulation) digital processor which decodes the signal back to analog audio. The resultant analog signal is then played over a conventional stereo system.

Public response to the WGBH-FM experiment has been favorable although limited to music aficionados who could afford and obtain the relatively expensive equipment required to decode the digital audio signals and enjoy the ultimate sound product. It has been predicted on the basis of experience with other developing technologies, that the relative expense of the equipment would diminish over time as the technology becomes more widespread.

While the WGBH experiment delivers a superior quality audio to listeners, its transmission methodology is spectrum-inefficient since the digital signal occupies a full six

megahertz for the single audio channel broadcast. At the same time, the WGBH experiment does indicate the interest of the public in quality audio and shows the need for the Commission to encourage further development of digital audio broadcasts.

C. Other Examples of Digital Audio Broadcast Methodologies

The "MUSE" high definition television system developed by the Japanese Broadcasting Company (NHK) facilitates transmission and reception audio quality that parallels that of compact disc recordings with pulsed code modulation techniques (PCM). The entire video and audio system occupies 8.1 megahertz, in contrast to the 6.0 megahertz channel bandwidth American television presently uses. While "MUSE" is intended for use in Japan as a satellite-based direct broadcast service (DBS), the audio transmission methodology should be investigated by the broadcast industry for possible applications to terrestrial broadcast systems in this country.

Other digital broadcast systems being developed would employ alternative modulation techniques. The Digital Broadcast Radio (DBR) system developed by the Digital Broadcast Radio Corporation of Reston, Virginia uses adaptive delta modulation encoding and quadrature phase modulation (QPSK) to transmit a digital signal. DBR operates on adjacent interstitial television channels--channels unusable in a particular area for high power TV due to TV mileage separation requirements; for example, in the Washington, D.C. TV market where channels 7 and 9 are in use, channels 8 and 10 would be available interstitial channels for DBR. The composite DBR signal consumes a bandwidth of less than

six megahertz and employs 12 digital audio channels. According to its developers, operation on interstitial television channels can be accomplished without interference to television operation due to low power radiation, colocation of TV and DBR transmitters and antennas, and use of quadrature phase modulation for transmission.

These examples demonstrate possible advanced audio technologies. The Commission should take into account the needs of these and other potential advancements in audio technology in its consideration of the remaining spectrum. Any Commission action should encourage and not preclude future development of advanced audio technology.

II. The Commission Should Assure that Broadcast Spectrum is Available for Advanced Audio Technologies

In this NOI the Commission has presented the communications industry with an opportunity to present information on options for spectrum usage. Although the NOI does not specifically include advanced audio technologies, the needs of this type of technology must be considered in any comprehensive review of spectrum allocation policies and plans.

Radio, like television, is experiencing difficulty in locating available spectrum in many markets. Spectrum congestion is a particular problem for public radio which generally operates in the portion of the FM band reserved for noncommercial educational use. The portion of the FM band reserved for NCE-FM experiences special pressures from rules limiting potential interference with TV Channel 6.

In the NOI, the Commission has indicated a willingness to consider elimination of the UHF taboos and relaxation of the mandatory NTSC standard in order to achieve greater flexibility to enable video broadcasters to enhance their transmission systems. NPR encourages the Commission to facilitate the enhancement of audio broadcasts as well by allowing, for example, aural broadcast use of portions of the video spectrum on a noninterference basis. Other possibilities for Commission action include allowing use of TV interstitial channels on a noninterference basis as well as the allocation and reservation of new spectrum for the development of advanced audio technologies.

Additional spectrum for broadcast audio is justified by the demonstrated importance of the audio service in information and entertainment programming. Spectrum should be made available now to encourage the domestic development of advanced audio technologies for broadcast use.

III. Conclusion

NPR looks forward to working with the Commission and the communications industry in developing advanced audio technologies. NPR urges the Commission to act in allocating spectrum to assure that digital audio and other advanced audio technologies will have the opportunity to evolve and develop in the future.

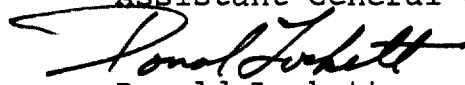
Respectfully submitted,



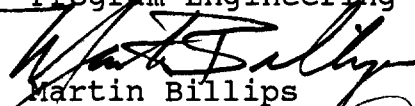
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Enclosure

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